AD-A198 147 STRUCTURE DYNAMICS OF EXCITED ATOMS(U) VIRGINIA UNIV 1/1
CHARLOTTESVILLE DEPT OF PHYSICS T F GALLAGHER
20 MAR 88 AFOSR-TR-88-0846 AFOSR-87-0005

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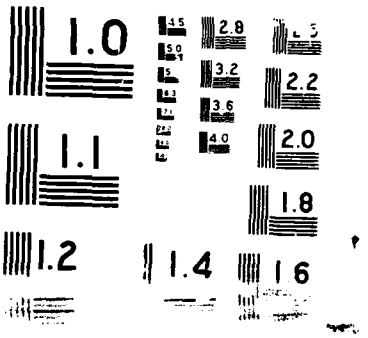
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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
LE	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; Distribution Unlimited
AD-A198 147 RIS)	5. MONITORING ORGANIZATION REPORT NUMBER(S) AFOSR-TR. 88-0846
6a. NAME OF PERFORMING ORGANIZATION University of Virginia 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION AFOSR
6c. ADDRESS (City, State and ZIP Code) Physics Department, University of Virginia McCormick Rd., Charlottesville, VA 22901	7b. ADDRESS (City, State and ZIP Code) BR 1410 Bolling Air Force Base, Washington DC 20332
8a. NAME OF FUNDING/SPONSORING ORGANIZATION AFOSR 8b. OFFICE SYMBOL (If applicable) NP	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER AFOSR-87-0005
8c. ADDRESS (City, State and ZIP Code) Bolling AFB / BR 1410 Washington, DC 20332	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO.: 61102F; PROJECT NO.: 2301; TASK NO.: A4; WORK UNIT NO.:
11. TITLE (Include Security Classification) Structure Dynamics of Excited Atoms	
12. PERSONAL AUTHOR(S) T.F. Gallagher	
13a. TYPE OF REPORT Final 13b. TIME COVERED FROM 10/1/86 TO 9/30/88	14. DATE OF REPORT (Yr., Mo., Day) 88 03 28 15. PAGE COUNT 1
16. SUPPLEMENTARY NOTATION	
17. COSATI CODES FIELD / GROUP / SUB. GR.	18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Using this DOD instrumentation grant, we acquired three types of instrumentation, a high repetition rate eximer laser, radiofrequency and microwave equipment, and signal acquisition equipment. This equipment allows us to do experiments with excited atoms that were beyond the reach of our previous equipment.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Dr Ralph E. Kelley	22b. TELEPHONE NUMBER (Include Area Code) 202/767-4908 22c. OFFICE SYMBOL NP

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MARCH 1988

UNIVERSITY OF VIRGINIA

STRUCTURE AND DYNAMICS OF EXCITED ATOMS

Final Technical Report
Grant No. AFOSR-87-0005

by

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Prepared for:

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I. Introduction

The purpose of this DOD instrumentation grant was to improve our research equipment. This improvement will have two primary benefits. First it allows us to carry out our AFOSR sponsored research in a more effective fashion, and second, it allows the graduate students trained at the University of Virginia to use modern equipment.

II. Equipment Procured

Using the instrumentation grant we have acquired three types of equipment. First we have purchased a high repetition rate Lambda-Physik eximer laser which we are using to pump several dye lasers. The eximer laser is particularly attractive as a pump laser for blue dye lasers. The eximer laser has been in constant use since June 1987, and we are now trying to improve our dye lasers to allow them to run at the 100 Hz repetition rate of the eximer laser. This will raise the rate of collecting data by a factor of five allowing new more sensitive experiments to be done.

The second major category of equipment we have purchased is radio frequency and microwave equipment. We have acquired a new Hewlett Packard (HP) sweep oscillator to replace our existing oscillator which is now 15 years old. Specifically we have purchased an HP 8350 mainframe and plug-in units to cover the ranges 2-8, 8-18, and 18-25 GHz. These are entirely solid state devices which can, if need be, be phase locked to an external crystal controlled counter. In the short time we have had it, the sweep oscillator has been used for several experiments and has been used to test several prototype microwave devices in both our laboratory and Professor Larson's. We have also bought a high power, 25W, low frequency 0.1-110 MHz ampifier which we have used to do radio frequency ionization experiments at 10 MHz. This general purpose piece of equipment has also proven to be useful to a solid state group, which has used it to do ultrasonic transmission experiments at liquid helium temperatures.

The third kind of equipment is signal acquisition and averaging equipment. Specifically we have bought a fast 350 MHz Tektronix oscilloscope for diagnosing fast signals, especially photoelectron signals, and a 150 MHz digitizing, averaging oscilloscope which enables us to record time resolved data in a particularly efficient fashion. Specifically we can record the entire time resolved signal after each laser shot, raising the effective data collection efficiency by a factor of fifty relative to using a boxcar averager as we now do. This makes experiments in, for example, the time dependence of microwave ionization possible. In addition we have acquired CAMAC modules to allow us to interface the experiments to a microcomputer in the most efficient fashion.

III. Conclusion

The DOD instrumentation grant has provided us with a valuable expansion of our research capability. Based on the positive effects in the short time since we have received the grant, I am optimistic that it will have a large long term positive effect.

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